

# Road M1.0 High Priority Watercourse Restorations at Mileposts 0.6, 0.7, 1.85, and 2.05

## EXISTING CONDITIONS AND PROJECT DESCRIPTION:

Four Class II watercourse crossings along Road M1.0 (see Sheet 2, Location Map) are composed of significant volumes of fill, are actively eroding, and have trapped substantial volumes of alluvial sediment. The culverts conveying water through the crossing fill prisms are high above the natural stream channel and are too small to convey the 100-yr flood and its associated load of sediment and debris. The fill prisms and stored sediment create an ecological obstruction between the forested uplands above the crossings and the Big River estuary and floodplain that is approximately 200 feet downstream of the crossings. Specific design data for each crossing is provided in Table 1 and Figure 1 (Plan Sheet 3) are representative cross sections that illustrates the ecological obstruction.

The California Department of Parks and Recreation (DPR) is removing these crossings to 1) remove the large volumes of stored sediment in the streams, 2) restore the impacted segments of these watercourses, and 3) reconnect the forested uplands to the Big River estuary and floodplain. Specific tasks include: 1) excavation and removal of the fill prisms, culverts, and stored alluvial sediment at the 4 crossing locations; 2) restore those sections of the Class II tributary channels that were buried; and 3) construct bridges above the restored channels to allow sunlight onto the riparian corridors, and to maintain access for pedestrians, equestrians, bicyclists, and occasional vehicle (official business only) traffic. The primary project benefit will be the reconnection of both terrestrial and aquatic habitat areas between four forested subwatersheds and the Big River floodplain and estuary. Secondary benefits include the removal of approximately 11,000 cubic yards of fill and sediment that exist in the channels and which are now a chronic source of sediment discharge. In addition, the removal of the culvert eliminates the need for maintenance and the potential for plugging and catastrophic failure.

The proposed project includes the construction of small bridges no more than 16 feet wide to accommodate pedestrians and vehicles on official business (maintenance and public safety). Alternatives to the bridges include standard corrugated metal pipes and open-bottom arched-culverts constructed from structural plates. Bridges are considered superior to either of the culvert systems because:

1) Culverts would be placed at the natural channel grade and therefore would have to be over 100 feet long. Consequently, the stream segments would not be restored because the 100-foot section would be deprived of sunlight thereby preventing the establishment of a properly functioning riparian corridor.

2) Construction of culverts requires engineered fill prisms incorporating significant volumes of imported fill (there are no approved quarry sites within the park area) to be placed directly in the stream channel. Thus, little stream restoration would result from such an effort and a large volume of sediment would remain in the channel.

3) The design life of the metal pipes is likely to be significantly reduced because of corrosion caused by the salt air.

4) Culverts have a potential to clog and therefore require annual maintenance to minimize the clogging potential, and even then upstream conditions could result in a flush of debris sufficient to clog the pipe.

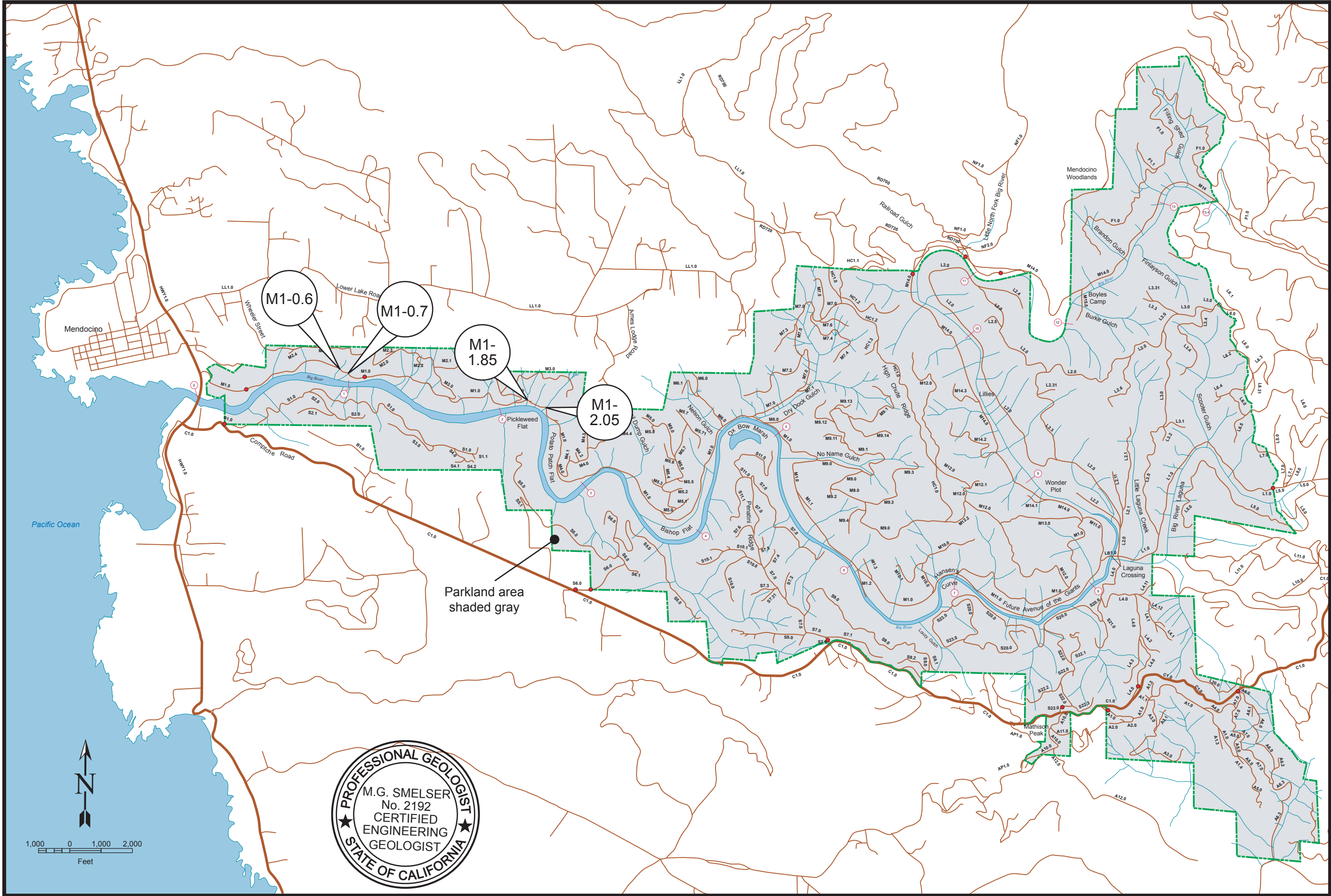
5) The upper portions of these tributary watersheds are privately owned residential properties in a semi-urban environment (Figure 2, Plan Sheet 3). Consequently, the potential for a range of impacts and greater stormwater runoff is significant yet unknowable. Thus, constructing bridges with much more conveyance capacity is more prudent than installing pipes sized for a 100-year flood.


The following plans are considered conceptual because they do not include details of bridge design and construction. Such details are outside of the scope of the restoration plans and will be developed by DPR's engineering corps under separate contract. While largely conceptual, the following plans were developed to support typical environmental permitting requirements, prepare reasonable project cost estimates, and support grant writing efforts. The full set of conceptual plans for the proposed work includes the following plan sheets and a booklet titled: *Standard Specifications & Best Management Practices for Disturbed Lands Remediation*. The plan sheets alone are insufficient to explain the proposed work.

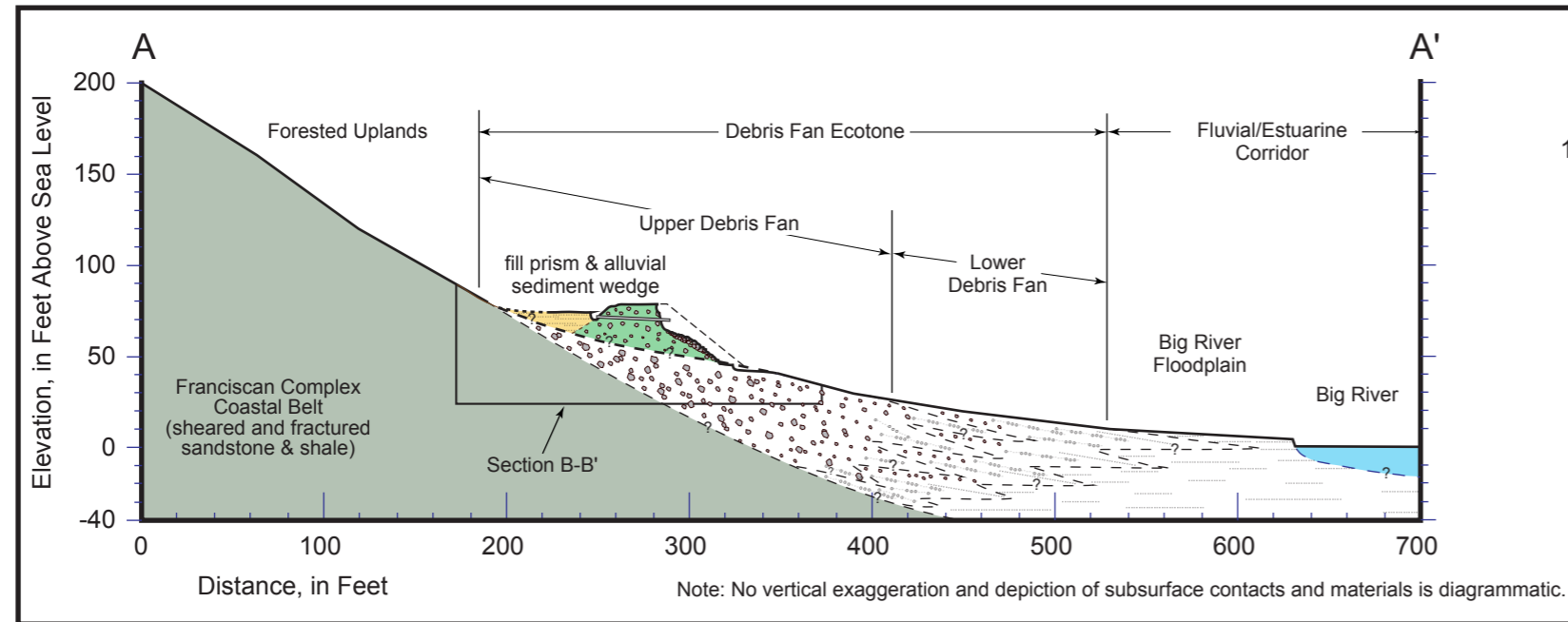
Table 1. Specific data for each of the Road M1.0 High Priority watercourse crossings.

Characteristic	Crossing Number			
	M1-0.6	M1-0.7	M1-1.85	M1-2.05
Milepost (miles from DPR gate)	0.6	0.7	1.85	2.05
Approximate natural stream gradient (%)	27	16	23	21
Depth of fill beneath road (ft)	17	19	12	13
Fill prism width perpendicular to travel way (ft)	25	25	30	30
Length of sediment wedge behind fill prism (ft)	50	110	35	45
Maximum width of sediment wedge (ft)	50	40	45	50
Estimated volume of sediment wedge (yds <sup>3</sup> )	220	460	80	140
Average length of fill prism along road (ft)	65	70	65	60
Estimated volume of fill prism in watercourse (yds <sup>3</sup> )	1,920	2,580	1,750	2,000
Sum of fill prism and sediment wedge (yds <sup>3</sup> )	2,140	3,040	1,830	2,140
<b>Estimated Total Fill Volume* (yds<sup>3</sup>)</b>	<b>2,570</b>	<b>3,650</b>	<b>2,200</b>	<b>2,570</b>
Watershed Area above crossing (acres)	20.9	48.1	63.3	64.2
100-year flood flow (cfs from the rational method)	60	140	180	180
Appropriate (2/3 full) sized pipe diameter (inches)	60	84	96	96
Bridge Design Length (ft)	75	80	70	65
Corridor/channel width beneath the bridge (ft)	15	20	25	25
Side slopes beneath the bridge (horizontal:vertical)	1.8:1	1.6:1	1.9:1	1.6:1
*includes 20% contingency				



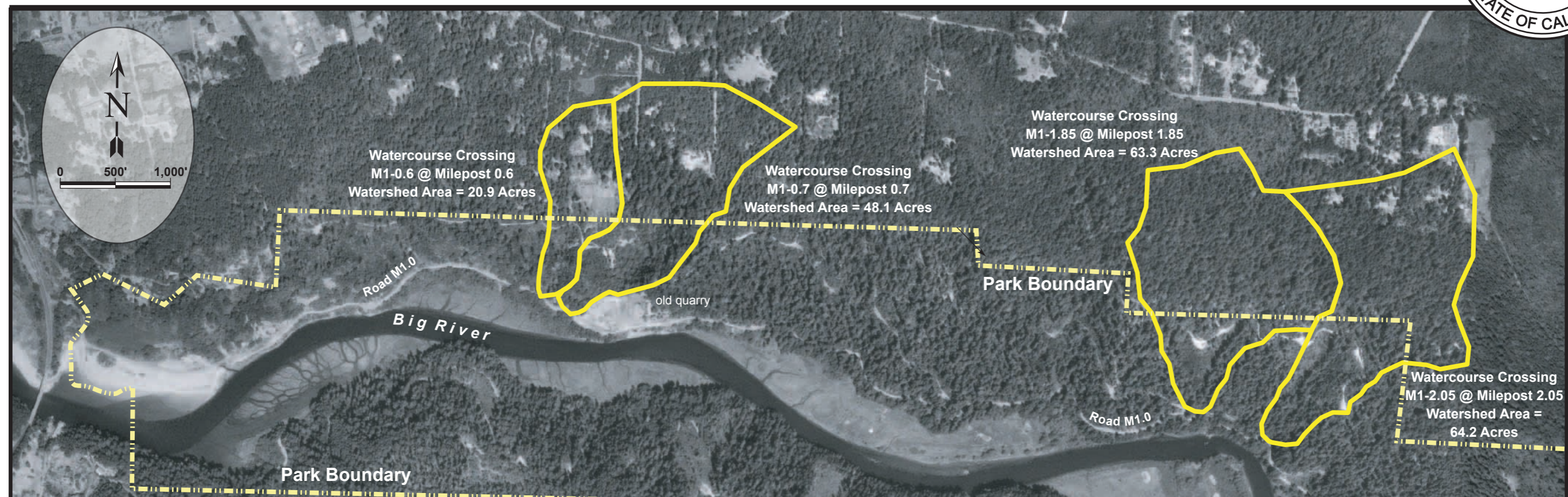


	PROJECT:	TITLE:	SHEET:
	Road M1-0.6 to M1-2.05, Watercourse Restorations Big River Unit Mendocino Headlands State Park, Mendocino, CA	Plan Sheet 2, Location Map Showing High Priority Watercourse Restoration Sites	2 of 7
		SCALE: 1 inch = 3,000 feet DATE: February 28, 2006	



**FIGURE 1 (above).** Engineering geologic cross sections through the watercourse crossing M1-0.6 at milepost 0.6. Section A-A' shows the fill prism and alluvial sediment wedge as a prominent ecological obstruction on the landscape between the forested uplands and the Big River estuary and floodplain. Section B-B' shows the degraded nature of the fill prism and the elevated pipe. Both sections are representative of the other three crossings (M1-0.7, M1-1.85, and M1-2.05).

**FIGURE 2 (below).** Aerial photograph (circa 1988) of Big River and the tributary watershed areas of the High Priority watercourse crossings. This photograph shows that much of the tributary watersheds are under private ownership in a semi-urban environment. This photograph also shows numerous old logging roads and historic debris slides in the tributary watersheds. Collectively, these data support the project design to construct bridges as the best approach to restore the watercourses, ensure conveyance of flood flows and debris, accommodate unknowable future impacts from upstream activities, and provide long-term access into the park area.

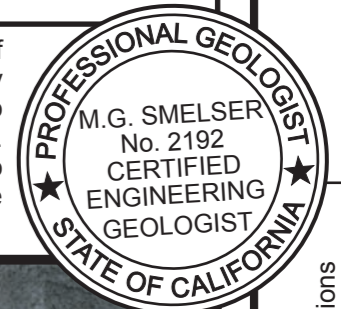


SHEET:

3 of 7

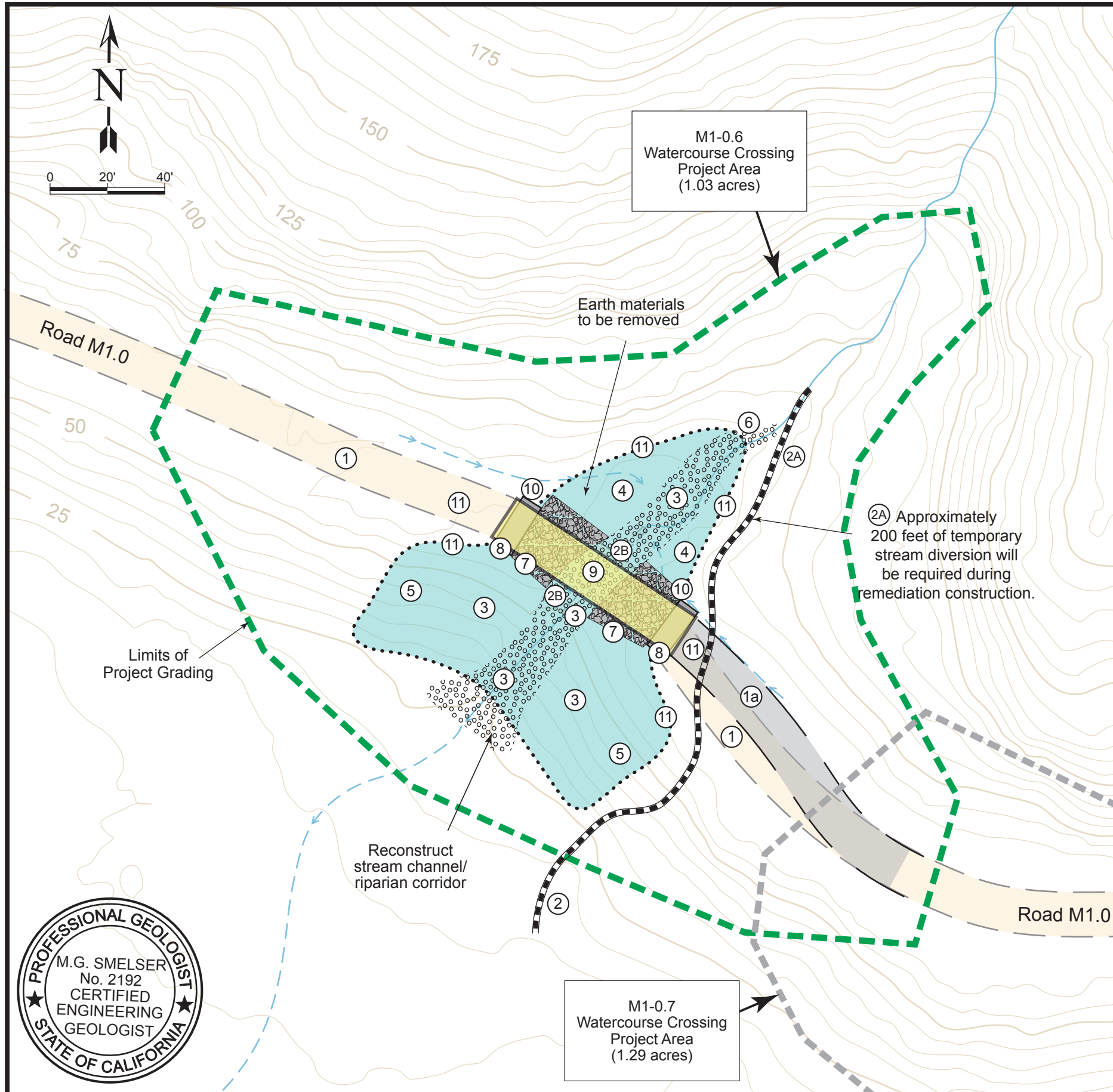
TITLE: Plan Sheet 3, Cross Sections and Aerial Photograph

SCALE: as shown  
DATE: February 28, 2006



PROJECT:  
Road M1-0.6 to M1-2.05, High Priority Watercourse Restorations  
Big River Unit  
Mendocino Headlands State Park, Mendocino, CA



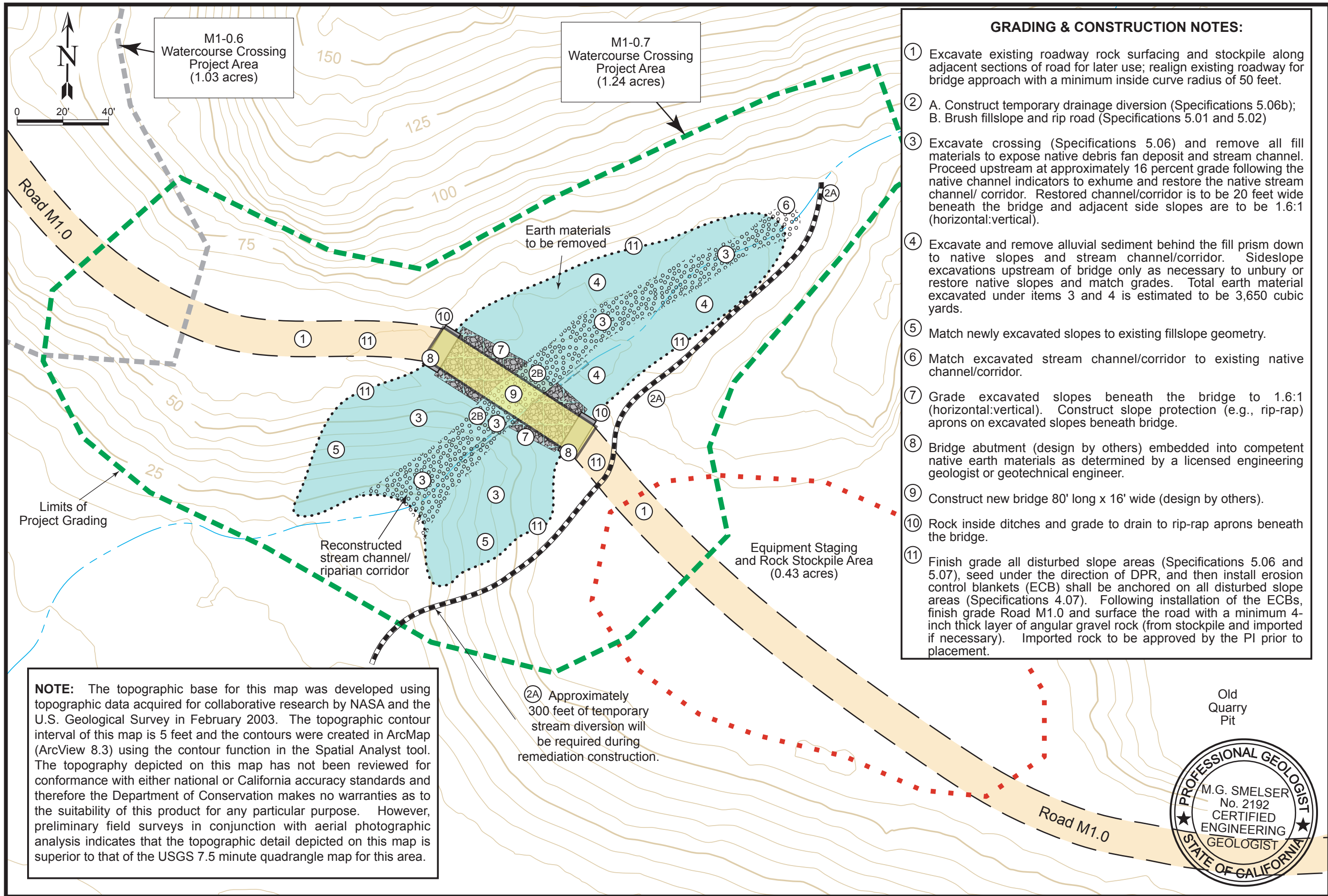


### GRADING & CONSTRUCTION NOTES:

- ① Excavate existing roadway rock surfacing and stockpile along adjacent sections of road for later use. ①a) realign existing roadway for bridge approach with a minimum inside curve radius of 50 feet.
- ② A. Construct temporary drainage diversion (Specifications 5.06b); B. Brush fillslope and rip road (Specifications 5.01 and 5.02).
- ③ Excavate crossing (Specifications 5.06) and remove all fill materials to expose native debris fan deposit and stream channel. Proceed upstream at approximately 27 percent grade following the native channel indicators to exhume and restore the native stream channel/ corridor. Restored channel/corridor is to be 15 feet wide beneath the bridge and adjacent side slopes are to be 1.8:1 (horizontal:vertical).
- ④ Excavate and remove alluvial sediment behind the fill prism down to native slopes and stream channel/corridor. Sideslope excavations upstream of bridge only as necessary to unbury or restore native slopes and match grades. Total earth material excavated under items 3 and 4 is estimated to be 2,570 cubic yards.
- ⑤ Match newly excavated slopes to existing fillslope geometry.
- ⑥ Match excavated stream channel/corridor to existing native channel/corridor.
- ⑦ Grade excavated slopes beneath the bridge to 1.8:1 (horizontal:vertical). Construct slope protection (e.g., rip-rap) aprons on excavated slopes beneath bridge.
- ⑧ Bridge abutment (design by others) embedded into competent native earth materials as determined by a licensed engineering geologist or geotechnical engineer.
- ⑨ Construct new bridge 75' long x 16' wide (design by others).
- ⑩ Rock inside ditches and grade to drain to rip-rap aprons beneath the bridge.
- ⑪ Finish grade all disturbed slope areas (Specifications 5.06 and 5.07), seed under the direction of DPR, and then install erosion control blankets (ECB) shall be anchored on all disturbed slope areas (Specifications 4.07). Following installation of the ECBs, finish grade Road M1.0 and surface the road with a minimum 4-inch thick layer of angular gravel rock (from stockpile and imported if necessary). Imported rock to be approved by the PI prior to placement.

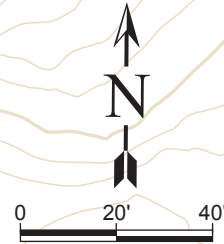
**NOTE:** The topographic base for this map was developed using topographic data acquired for collaborative research by NASA and the U.S. Geological Survey in February 2003. The topographic contour interval of this map is 5 feet and the contours were created in ArcMap (ArcView 8.3) using the contour function in the Spatial Analyst tool. The topography depicted on this map has not been reviewed for conformance with either national or California accuracy standards and therefore the Department of Conservation makes no warranties as to the suitability of this product for any particular purpose. However, preliminary field surveys in conjunction with aerial photographic analysis indicates that the topographic detail depicted on this map is superior to that of the USGS 7.5 minute quadrangle map for this area.



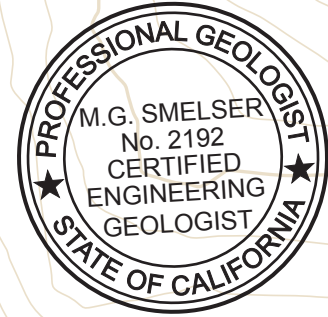


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- ② A. Construct temporary drainage diversion (Specifications 5.06b);  
B. Brush fillslope and rip road (Specifications 5.01 and 5.02)
- ③ Excavate crossing (specification 5.06) and remove all fill materials to expose native debris fan deposit and stream channel. Proceed upstream at approximately 23 percent grade following the native channel indicators to exhume and restore the native stream channel/ corridor. Restored channel/corridor is to be 25 feet wide beneath the bridge and adjacent side slopes are to be 1.9:1 (horizontal:vertical).
- ④ Excavate and remove alluvial sediment behind the fill prism down to native slopes and stream channel/corridor. Sideslope excavations upstream of bridge only as necessary to unbury or restore native slopes and match grades. Total earth material excavated under items 3 and 4 is estimated to



M1-1.85  
Watercourse Crossing  
Project Area  
(1.9 acres)



SHEET:

6 of 7

TITLE:  
Plan Sheet 6, Watercourse Crossing M1-1.85

SCALE: ☐ 1 inch = 40 feet  
DATE: ☐ February 28, 2006

**PROJECT:**  
Road M1-0.6 to M1-2.05, High Priority Watercourse Restorations  
Big River Unit  
Mendocino Headlands State Park, Mendocino, CA

PROJECT:



**GRADING & CONSTRUCTION NOTES (continued):**

- ⑤ Match newly excavated slopes to existing fillslope geometry.
- ⑥ Match excavated stream channel/corridor to existing native channel/corridor.
- ⑦ Grade excavated slopes beneath the bridge to 1.9:1 (horizontal:vertical). Construct slope protection (e.g., rip-rap) aprons on excavated slopes beneath bridge.
- ⑧ Bridge abutment (design by others) embedded into competent native earth materials as determined by a licensed engineering geologist or geotechnical engineer.
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# Big River

